Fishes of Texas Project (fishesoftexas.org)

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Discovery of the Mexican Blindcat, *Prietella phreatophila*, in the U.S., and an update on its rangewide conservation status

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Prietella phreatophila - background

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- **Blind, depigmented cave–obligate catfish**
- **One of 4 stygobitic Ictalurid species (in 3 genera) endemic to North American karst aquifers that feed rivers from San Antonio River (Texas, USA) to Río Pánuco (Tamaulipas, México)**

Prietella phreatophila – pre 1990s history

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CIENCIA

REVISTA HISPANO-AMERICANA DE CIENCIAS PURAS Y APLICADAS

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PUBLICACION MENSUAL DEL
PATRONATO DE CIENCIA

MEXICO, D. F.
PUBLICADO: 15 DE DICIEMBRE DE 1954

PUBLICADO CON LA AYUDA ECONOMICA DEL INSTITUTO NACIONAL DE LA INVESTIGACION CIENTIFICA DE MEXICO
REGISTRADA COMO ARTICULO DE 2a. CLASE EN LA ADMINISTRACION DE CORREOS DE MEXICO, D. F., CON FECHA 21 DE OCTUBRE DE 1946

Comunicaciones originales

DESCRIPCION DEL PRIMER BAGRE ANOFTALMO Y DEPIGMENTADO ENCONTRADO EN AGUAS MEXICANAS[1]

(Pisc., Ameiur.)

Durante los últimos días del mes de agosto de 1954, el Dr. Cándido Bolívar y Pieltain, del Instituto Politécnico Nacional, y el autor de este trabajo, tuvieron la oportunidad de visitar varios pozos y socavones, tanto naturales como artificiales de la región cársica de Múzquiz, estado de Coahuila, colectando, en uno de ellos, una extensa serie de un bagre carente de ojos y depigmentado, que al estudiarlo demostró ser una forma genérica nueva para la ciencia.

El hallazgo fué factible gracias a la generosidad del Lic. Carlos Prieto, quien patrocinó el viaje desde México y dió todas las facilidades necesarias al haber sido informado por su amigo, el Sr. Henry J. Sanford, Gerente de la Compañía Carbonífera de Sabinas, de la posible existencia de un pez ciego en las cercanías del poblado de Nueva Rosita, Coah. A ambas personas y al Ing. Salvador Garza Dávila, quien colaboró de un modo directo en la captura de los ejemplares, el autor expresa su más sincero agradecimiento, tanto por la ayuda recibida y las facilidades puestas a su disposición durante el viaje, como por el interés demostrado en el estudio de este pez.

De un modo especial quiero hacer constar la ayuda recibida de mi entusiasta compañero de viaje, el Dr. Cándido Bolívar, durante toda la realización del trabajo.

El pozo en que se descubrió el nuevo bagre, está situado al pie de la Sierra de Santa Rosa, a 260 m de altitud, en un lugar conocido localmente como "El Potrero de Doña Mariana", o simplemente "El Potrero", Municipio de Múzquiz, Coahuila (ver mapa). Es un pozo artificial de unos 3 m de diámetro, en el que el nivel freático se encuentra a escasos 2,5 m de la superficie. Está situado a unos 50 m del arroyo Salinas, afluente del río Sabinas. "El Potrero" tiene acceso por la carretera Rosita-Múzquiz. A 30 800 m de Rosita existe una brecha al lado izquierdo de la carretera que conduce en dirección W, después de 5 kilómetros, a la localidad típica.

El pozo abastece de agua potable a la población de Nueva Rosita en tiempos de escasez. El día que lo visitamos, el agua tenía una temperatura de 29°, pero fuimos informados que cuando se bombea hacia la población, la temperatura de la que fluye de las cavidades del subsuelo es algo mayor. Esto parece corroborarlo el hecho de que el agua que se estaba extrayendo de otro pozo situado a unos 30 m de distancia, tenía una temperatura de 30,5°. Según se nos informó, la temperatura del agua permanece constante dentro de ciertos límites, durante todo el año; este dato pudimos comprobarlo gracias a la gentileza del Sr. Sanford, quien nos comunicó por carta, que el día 6 de diciembre de 1954, el agua del "Potrero" estaba a 30,7°.

En la misma región de Múzquiz se visitaron otros pozos y una mina, en otro tiempo inundada, en la que se nos había dicho que también vivían peces ciegos, pero en ninguno de los casos nos fué posible comprobar su presencia, lo cual de ningún modo invalida la posibilidad de que el informe sea verídico. En efecto, estos

[1] Este trabajo se realizó en el Laboratorio de Ictiología del Instituto Mexicano de Recursos Naturales Renovables.

- **Carranza 1952 – 1 locality, 66 specimens in 2 days trapping**
- **1961, 1969, 1984 – various single specimens from type locality**
- **1986 – TCWC (A&M) – El Socavón, very near type locality – 1 specimen**
- **1986 – TNHC (UT) – 1 specimen from Ojo Yermo, 48 km N of type locality**

Listing history

- 1970 - U.S. Fish and Wildlife Service listed (on Foreign Species List) as Endangered
- 1990 – Endangered by IUCN
- 1994 – Endangered by México - D.O.F. NOM-059-ECOL

Prietella phreatophila – current IUCN status

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Contreras-Balderas, S. & Almada-Villela, P. 1996. *Prietella phreatophila*. The IUCN Red List of Threatened Species 1996: e.T18136A7669809. http://dx.doi.org/10.2305/IUCN.UK.1996.RLTS.T18136A7669809.en.

Complete content less taxonomy and occurrences (simply "Mexico") is shown below. No methodology/justification/discussion of categorization & criteria used. Just "Salvador said".

Assessment Information [top]

Red List Category & Criteria:	Endangered A1ace+2ce, B1+2bc ver 2.3
Year Published:	1996
Date Assessed:	1996-08-01
Annotations:	Needs updating
Assessor(s):	Contreras-Balderas, S. & Almada-Villela, P.
Previously published Red List assessments:	1994 – Endangered (E) 1990 – Endangered (E) 1988 – Indeterminate (I) 1986 – Indeterminate (I)

Habitat and Ecology [top]

Habitat and Ecology:	Found in wells.
Systems:	Freshwater

Prietella phreatophila – 1992 - 2001 knowledge

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- **1992 – Sotano de Amezcua specimens to TNHC**
- **1993, 1994, 1996-8 Hendrickson et al. fieldwork in México**
- **1992-2016 Captive stock in Hendrickson lab**
- **2001 Hendrickson, Krejca, Rodríguez Martinez**

Environmental Biology of Fishes **62:** 315–337, 2001.

Mexican blindcats genus *Prietella* (Siluriformes: Ictaluridae): an overview of recent explorations

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Key words: cave fish, stygobite, fish conservation, distribution, behavior, habitat

Synopsis

The ictalurid genus *Prietella* was described from a single locality in northern México (Coahuila) in 1954, and until very recently went largely unstudied. Cave explorers have recently uncovered new localities and a second species much farther to the south (México: Tamaulipas). Our team visited over 50 sites, including all of the previously known sites possible, and explored many new sites, expanding the known range of *Prietella* and describing their habitat. We identified geological units and mapped caves, identified associated troglobitic invertebrates, estimated population sizes and measured water chemistry parameters. We also comment on laboratory diet, parasites, sensory biology, behavior (such as jaw locking and periods of inactivity), reproduction and systematics based on preliminary genetic data. *Prietella phreatophila* is listed as endangered, and due to the recent discovery of many more sites (formerly documented from three localities, now known from twelve sites, though some are hydrologically connected) we recommend threatened status, with careful attention to growing threats such as over pumping and contamination of the aquifer it lives in. Should these patterns continue unchecked, re-listing this species as endangered may be called for. *Prietella lundbergi* was also described from one site but is now known from two, though it is quite rare at both (only five specimens have ever been seen). *P. lundbergi* was described after the most recent revision of the Mexican endangered species list and should probably be considered as endangered.

Prietella spp. –1992-199 collections

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Table 1. List of localities with word descriptions. The numbers correspond to Figure 1, and the site names correspond to descriptions in text. Italicized sites are documented blindcat sites (asterisks indicate no museum specimens are available, as they have only been reported from these sites – see text in Methods section for explanation). Abbreviations: Cd. = Ciudad; Co. = County; Coah. = Coahuila; Mex. = México; Tamps. = Tamaulipas; Tx. = Texas. When descriptions of localities are within 15 km of a town, the distance is given from the center of the town.

1.	Dandridge Spring and Richter Cave	40 km SW Sonora, Sutton Co., Tx.
2.	Devil's Sinkhole	10 km NE Rocksprings, Edwards Co., Tx.
3.	Big Tree Cave and Emerald Sink	5 km NNE Langtry, Val Verde Co., Tx.
4.	Emilio's Cavern	Comstock, Val Verde Co., Tx.
5.	Goodenough Springs	38 km NW of Del Rio, Val Verde Co., Tx.
6.	San Felipe Springs	Del Rio, Val Verde Co., Tx.
7.	*Sótano de Amezcua* and La Rajada	40 km W of Ciudad Acuña, Coah., Mex.
8.	*Noria de San Pedro**	32 km WSW of Santa Eulalia, Coah., Mex.
9.	La Vinata Well	18 km SW of Santa Eulalia, Coah., Mex.
10.	Cueva de Rancho Las Pilas	90 km SW of Ciudad Acuña, Coah., Mex.
11.	El Abra and Tinaja Azul	75 km W of Piedras Negras, Coah., Mex.
12.	*Ojo del Yermo*	60 km N of Melchor Múzquiz, Coah., Mex.
13.	Poza San Miguel	35 km NW of Allende, Coah., Mex.
14.	*El Consuelo**	16 km NW of Allende, Coah., Mex.
15.	*La Tembladora**	5 km SW of Allende, Coah., Mex.
16.	Nacimiento Kikapoo and Falcón well	33 km NW of Melchor Múzquiz, Coah., Mex.
17.	*Cueva de Juana*	22 km W of Melchor Múzquiz, Coah., Mex.
18.	*El Socavón area: El Socavón, above El Socavón 1 and 2, El Cedral*	5 km SW of Melchor Múzquiz, Coah., Mex.
19.	*El Potrero area: 1 and 2*, Tiro Palmito, and vertical mine shaft near El Potrero	8 km SE of Melchor Múzquiz, Coah., Mex.
20.	Cueva Cabrito	9 km WSW of Estación Obayos, Coah., Mex.
21.	Cueva La Zumbadora	4 km NW of La Madrid, Coah., Mex.
22.	Cueva El Venado	El Venado, 22 km SE of Cuatro Ciénegas, Coah., Mex.
23.	Mojarral East and West, La Campana	15 km SSE of Cuatro Ciénegas, Coah., Mex.
24.	Gruta de Carrizal	Candela, Coah., Mex.
25.	Cueva de El Tule and Cueva de la Espantosa	Lampazos, Nuevo Leon, Mex.
26.	El Ebanito	15 km SW of Linares, Nuevo León, Mex.
27.	Purificacion area Caves	30 km NW of Cd. Victoria, Nuevo León and Tamps., Mex.
28.	El Sótano	3 km ENE of El Carrizo, Tamps., Mex.
29.	Ojo Encantado	30 km W of Cd. Victoria, Tamps., Mex.
30.	Manantial La Penita and Cueva del Manantial La Penita	5 km W of Cd. Victoria, Tamps., Mex.
31.	Guayalejo Spring	Juamave, Tamps., Mex.
32.	*Cueva del Nacimiento del Río Frío* and Nacimiento del Río Frío	32 km NW of Cd. Mante, Tamps, Mex.
33.	Springs near San Rafael de los Castro	San Rafael de los Castro, Tamps., Mex.
34.	*Manantial de San Rafael de los Castro* and Cueva del Manantial de San Rafael de los Castro	11.5 km W of Cd. Mante, Tamps., Mex.

Sampled 34 localities:

- **Texas – 6 (not found)**
- **Coahuila – 18 (present at 9)**
- **Nuevo León – 3 (not found)**
- ***P. lundbergi***
- **Tamaulipas – 7 (present at 1)**

Prietella spp. – 1992-1997 results

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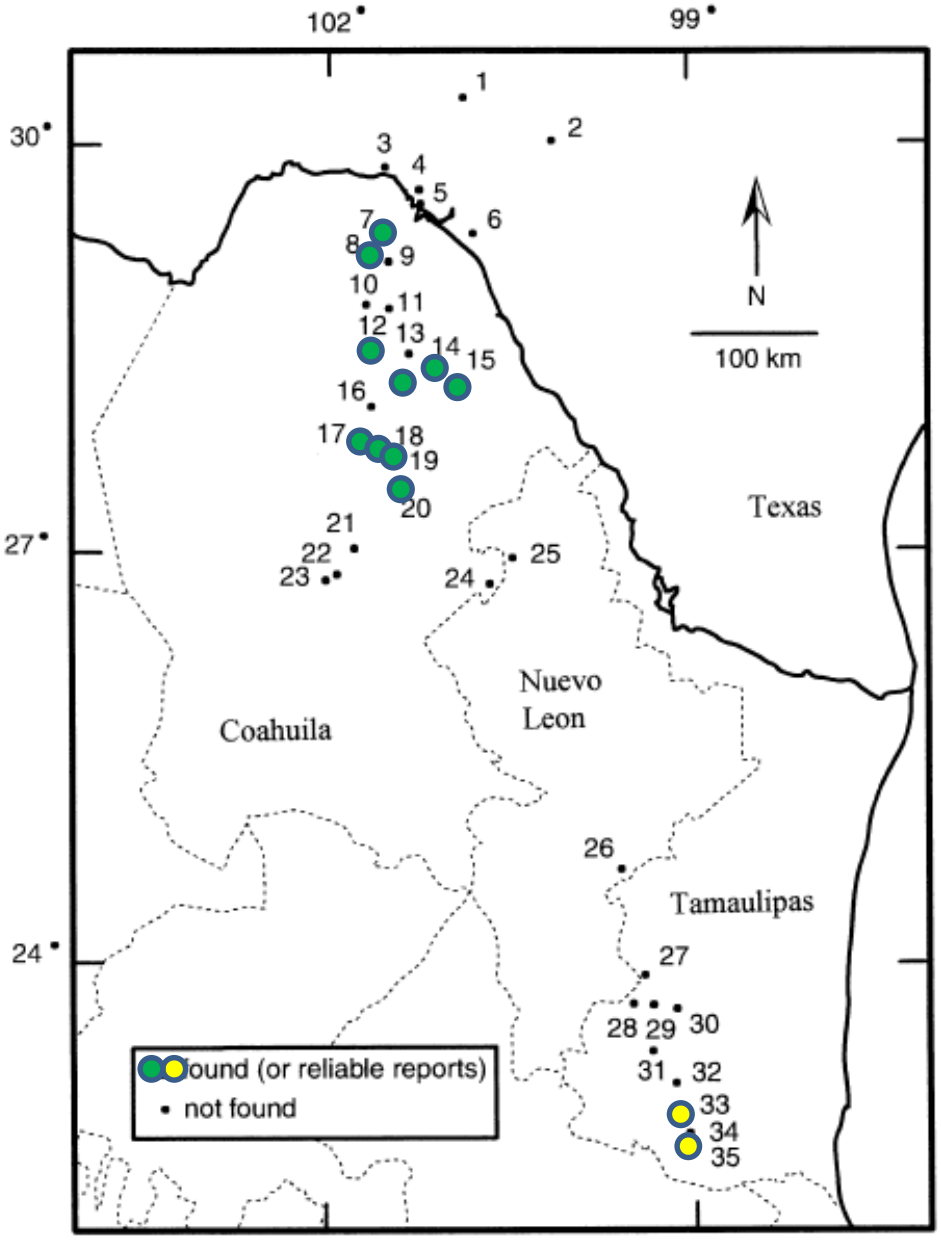

Hendrickson et al. 2001 sampled 34 localities:

- **Texas – 6 (present at 0)**
- **Coahuila – 18 (present at 9)**
- **Nuevo León – 2 (present at 0)**

- **Tamaulipas – 7 (*P. lundbergi* present at 1)**

Some of the live stock from 1997 still lives. Lots of interesting observations

Prietella spp. – evolutionary history

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Molecular Phylogenetics and Evolution 31 (2004) 1101–1113

MOLECULAR PHYLOGENETICS AND EVOLUTION

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Convergence among cave catfishes: long-branch attraction and a Bayesian relative rates test

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[b] *Laboratorio de Biología Integrativa, Instituto Tecnológico de Cd. Victoria, A.P. 175, 87010, Cd. Victoria, Tamaulipas, Mexico*
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1. **Before this paper, morphology placed *Prietella* sister to *Noturus.***

2. **We found *Prietella phreatophila (Coahuila)* & *P. lundbergi* (Tamaulipas) are distant relatives and genus not monophyletic. *P. phreatophila* derived from an *Ameiurus* and *P. lundbergi* from *Ictalurus*.**

3. **All Coahuila specimens represent a single species.**

Prietella phreatophila – captive behavior

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Taking a break (this one 16 minutes)

April 22, 2015 – 2-3 "white catfish" seen in cave survey in Amistad National Recreation Area near Del Rio, Texas

NPS quickly issued permit and funded periodic monitoring program of several caves in vicinity

4 visits before:

Prietella phreatophila – NOW FINALLY

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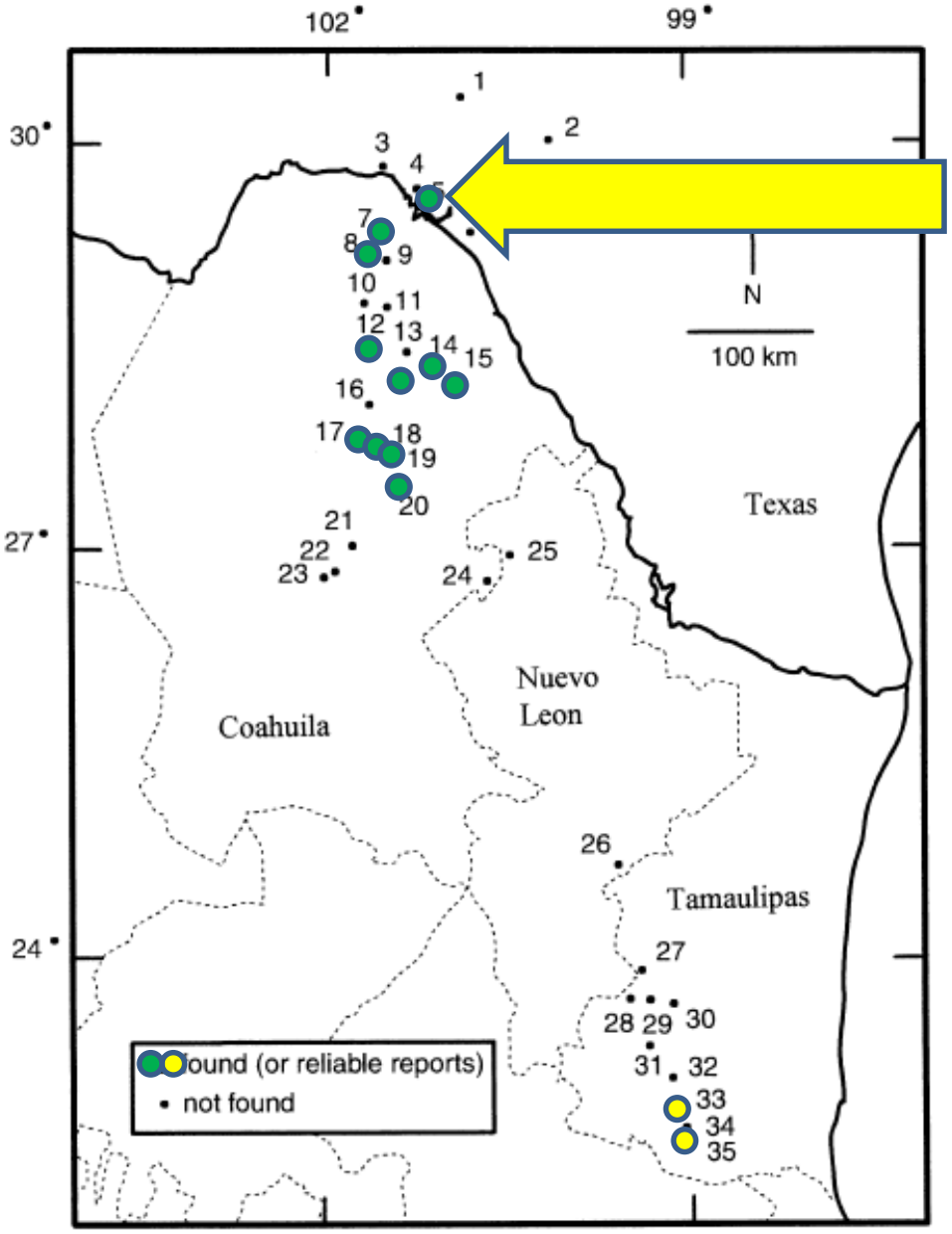

2015-2016 - new Texas locality

- May 11, 2016 - 3 specimens collected in cave of original sighting
- Live specimens to UT Austin Fish Collection (TNHC)

And, it immediately had full protection as Endangered in U.S.

Prietella phreatophila – 2016 – TX specimen

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Prietella phreatophila – 2016 – TX specimen

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Prietella phreatophila – 2016 – TX specimen

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Prietella phreatophila – current knowledge

- **Morphology & Cyt b sequence validated conspecificity of Texas specimens with Coahuila specimens (1% divergent)**

Now we have lots of new info relevant for

updating Conservation Assessment

- **New knowledge of distribution / abundance**
- **Observations from captivity**
- **Habitat**

Prietella phreatophila – HABITAT

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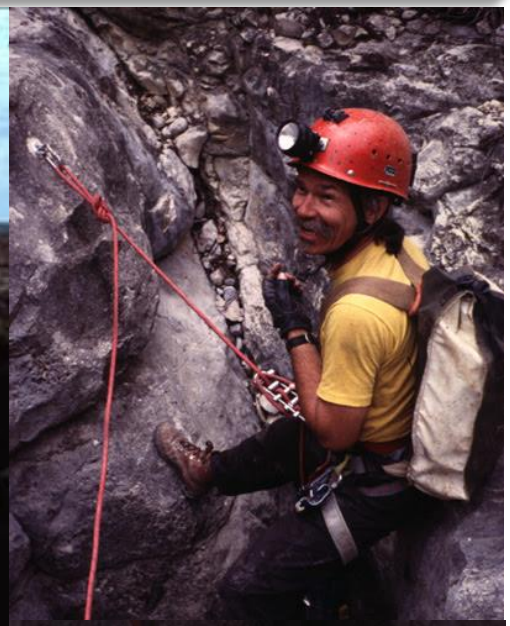

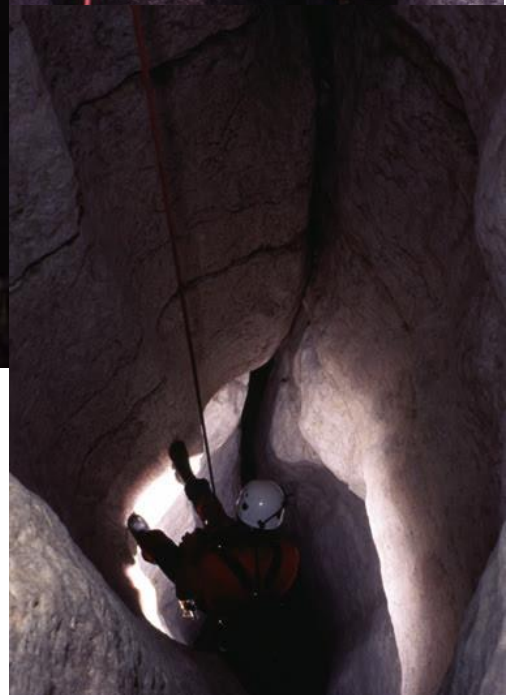

Found in diverse habitats, including hand-dug wells, but mostly relatively deep caves in intermittent, very dynamic underground desert streams. Similar to flashy surface Chihuahuan Desert streams, but on steroids!

Sótano de Amezcua - Total length surveyed 675 m; depth 83m

Prietella phreatophila – HABITAT

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Prietella phreatophila – HABITAT

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Prietella phreatophila –1992-1997 results

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Prietella phreatophila –1992-1997 habitats

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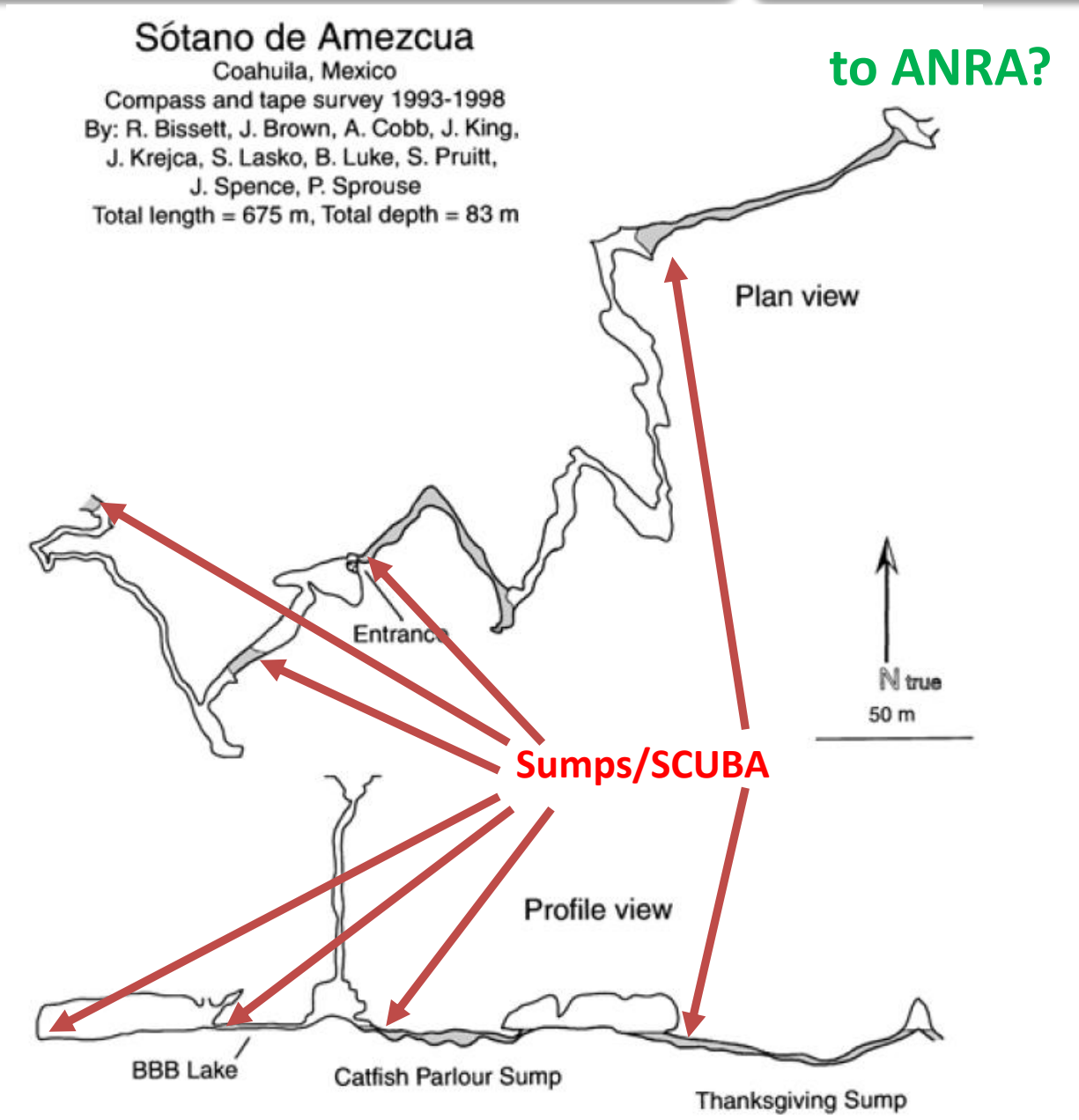

Prietella phreatophila – TEXAS HABITAT

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Texas cave - variable water levels (likely connection to Lake Amistad) affected access and sampling

Prietella phreatophila – new captive population

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May 25, 2016 – 2 remaining live Texas specimens transferred on loan to San Antonio Zoo Conservation Program

June 2016 – both remaining live 20+ year old specimens from Coahuila collections to San Antonio Zoo

Prietella phreatophila – What now?

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The University of Texas at Austin
College of Natural Sciences

Students Faculty & Research

NEWS
From the College of Natural Sciences

Font size: Share

Rare, Blind Catfish Never Before Found in U.S. Discovered in Texas

Featured Friday, 17 June 2016 Christine S Sinatra Integrative Biology

An extremely rare eyeless catfish species previously known to exist only in Mexico has been discovered in a National Recreation Area in Texas.

These Mexican blindcats were discovered in an underwater cave in Texas. Photo: Danté Fenolio.

Dean Hendrickson, curator of ichthyology at The University of Texas at Austin, identified the live fish, discovered in a deep limestone cave at Amistad National Recreation Area near Del Rio, Texas, as the endangered Mexican blindcat (*Prietella phreatophila*). The pair of small catfish, collected by a team in May, have been relocated to the San Antonio Zoo.

June 17, 2016 – Press release

Additional Texas fieldwork pending USFWS Endangered Species research permit

Proposals in process include:

- **Expansion / continuation ANRA monitoring**
- **Coahuila re-survey to update conservation assessment**
- **Captive breeding at SA Zoo**
- **eDNA**

Started working on updated conservation assessment

Prietella phreatophila – new status assessment

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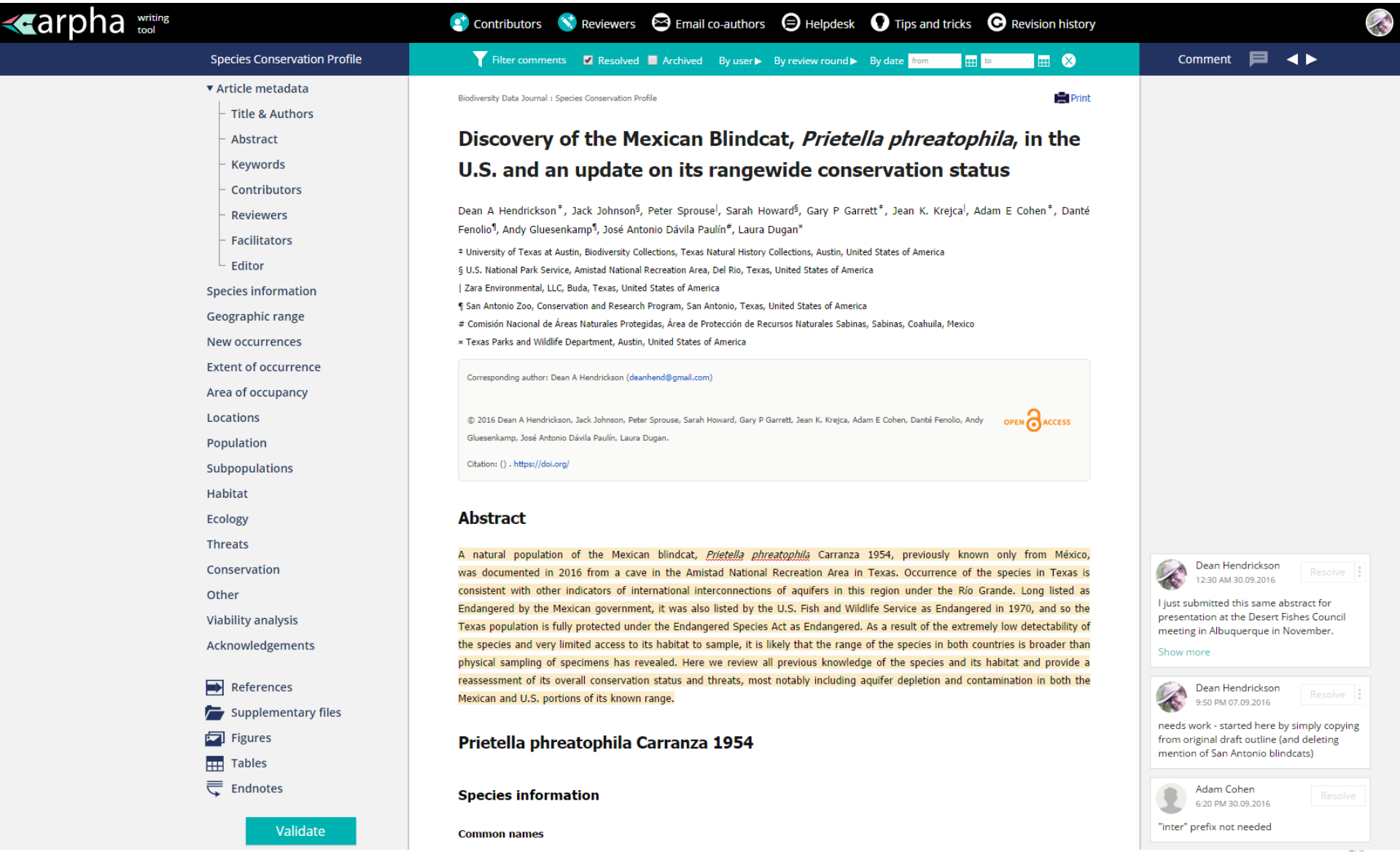

Prietella phreatophila – shared aquifers

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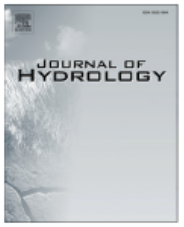

Identifying and characterizing transboundary aquifers along the Mexico–US border: An initial assessment

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SUMMARY

The transboundary nature of water dividing Mexico and the United States (U.S.) transforms the entire border region into an instrument of cooperation, a source of conflict, a national security issue, and an environmental concern. Reasonable data collection and research analysis have been conducted for surface waters by joint governmental institutions and non-governmental bodies. However, with the exception of the U.S. Transboundary Assessment Act Program (TAAP) (focusing on the Hueco Bolson, Mesilla Bolson, San Pedro and Santa Cruz aquifers), there is no comparable research, institutional development, or assessment of transboundary groundwater issues on the frontier. Moreover, data collection and methodologies vary between the two countries, there is no broadly accepted definition of the transboundary nature of an aquifer, and available legal and policy frameworks are constrained by non-hydrological considerations. Hence, there is a conceptual and institutional void regarding transboundary groundwater resources between Mexico and the U.S. The purpose of this paper is to bridge this void and characterize transboundary aquifers on the Mexico–US border. It reviews existing international frameworks for identifying hydrological and social criteria that characterize an aquifer as transboundary. It then assesses data from both countries to propose where and which aquifers could be considered transboundary. Finally, the paper proposes an agenda for assessing Mexico–US transboundary aquifers as a means for improving groundwater management in the border region.

Prietella phreatophila – shared aquifers

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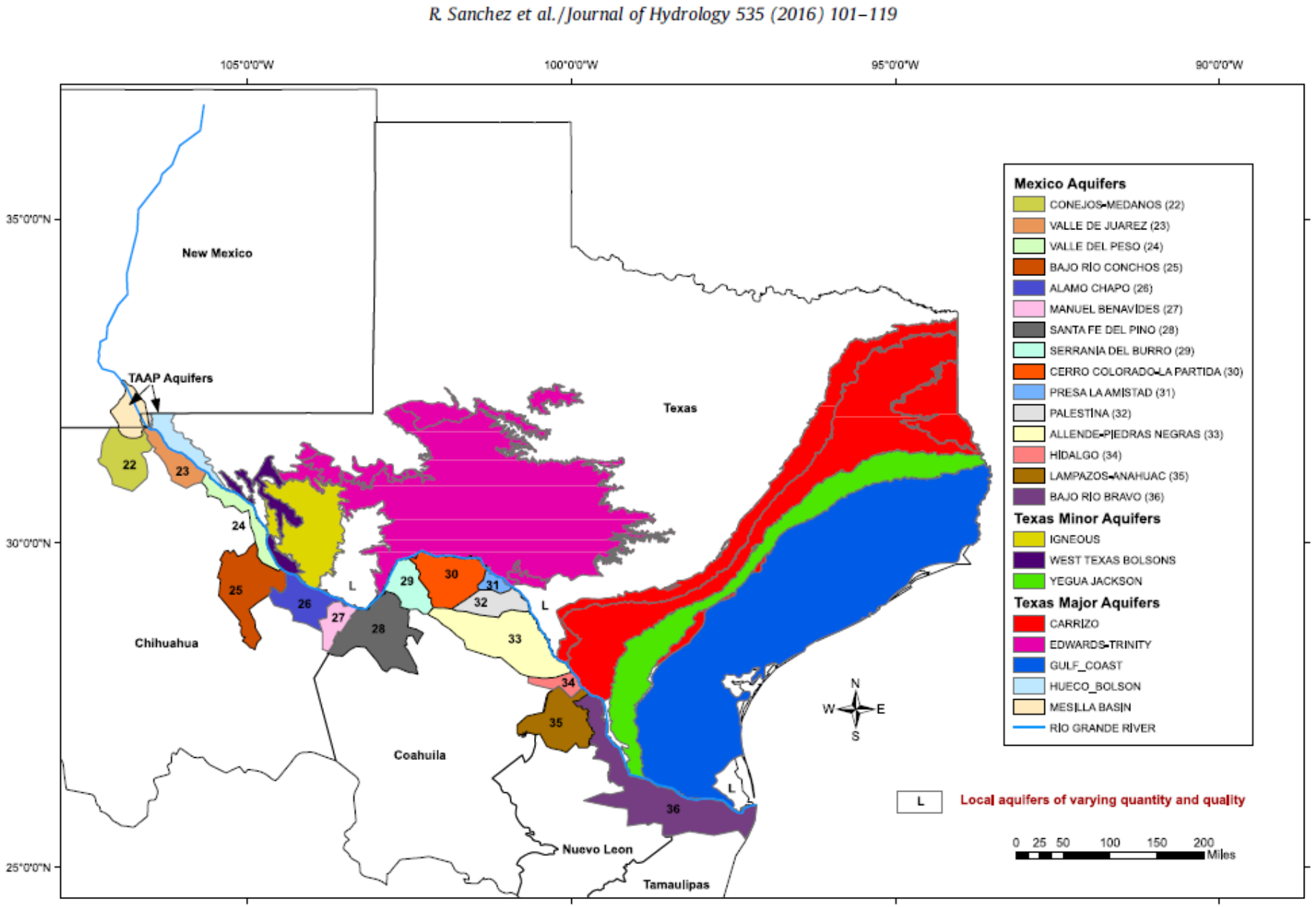

Prietella phreatophila – evolutionary history

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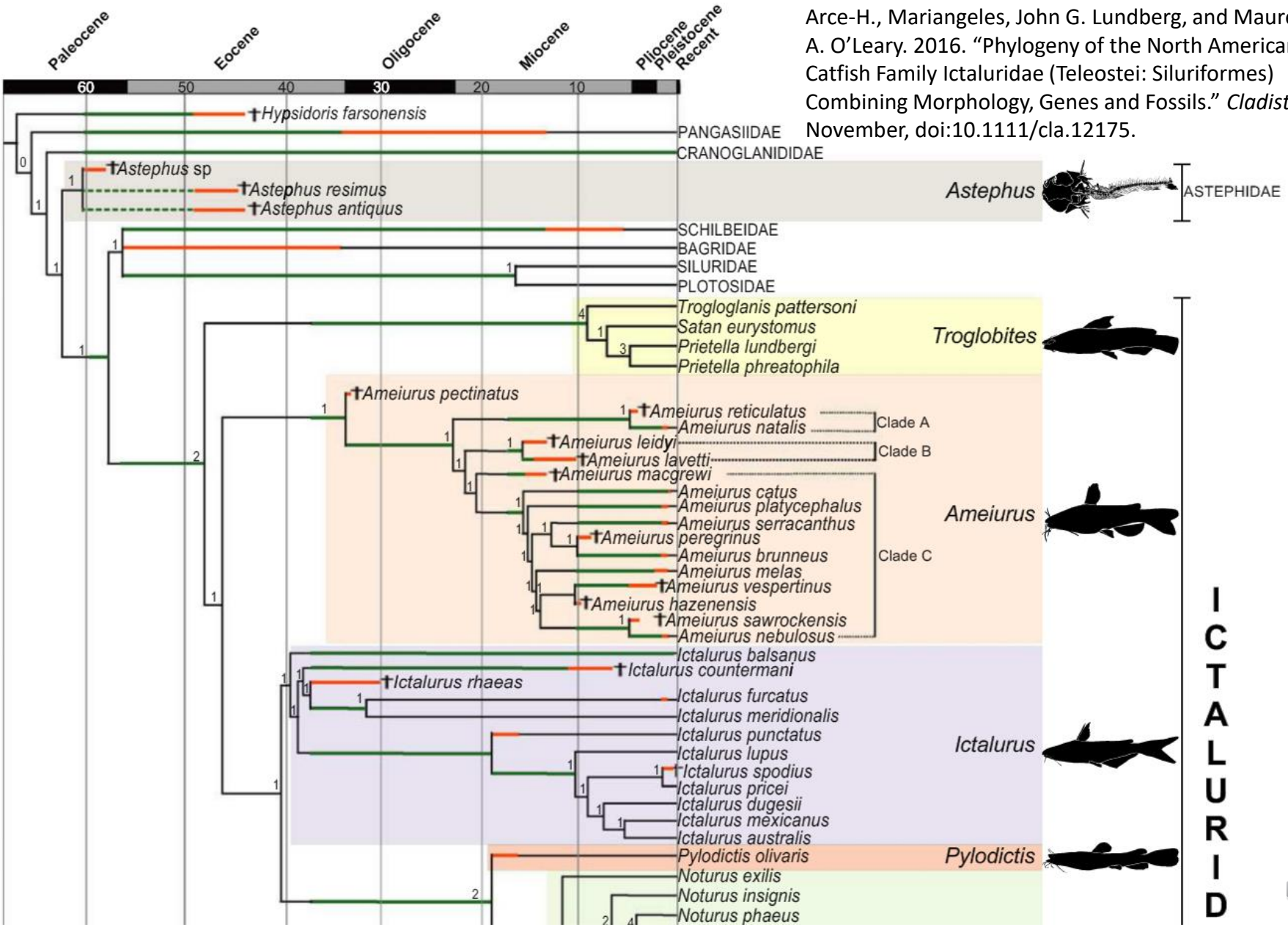

Arce-H., Mariangeles, John G. Lundberg, and Maureen A. O'Leary. 2016. "Phylogeny of the North American Catfish Family Ictaluridae (Teleostei: Siluriformes) Combining Morphology, Genes and Fossils." *Cladistics*, November, doi:10.1111/cla.12175.

Prietella phreatophila – new status assessment

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- **Distribution** – much better documented via 1990s explorations and now TX extension
- **Basic biology** – much learned from previous explorations and captive stock
- **Genetic structure** – now known via specimens collected in 1990s and now TX
- **Threats**
  - Edwards Trinity aquifer is the primary water source for Del Rio and is threatened by water speculators from elsewhere buying water rights
  - Socavón (Múzquiz water supply) has stopped flowing in recent years
  - Cd. Acuña – Piedras Negras – Monclova rapidly growing and adding industry
  - Coal mining expanding in Texas and Mexico for coal plant S of Piedras Negras
  - Agriculture
  - Contamination (extensive new oil and gas development and pipelines)
- **Protection**
  - Listed as endangered in BOTH México and U.S.
  - Some of the shared aquifers are now acknowledged (but not necessarily by Texas) and jointly managed by both countries
  - Texas population in NPS Recreation Area and much of the southern range is now within a federal reserve (Área de Protección de Recursos Naturales Sabinas)

Prietella lundbergi or what?

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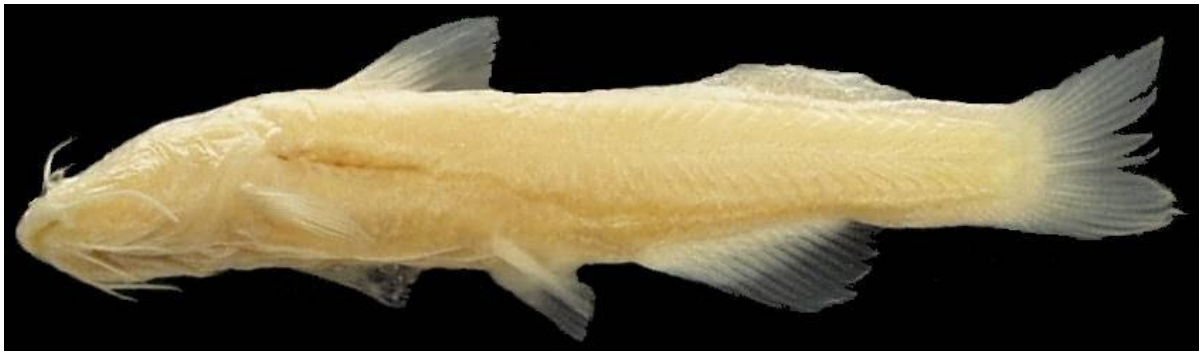
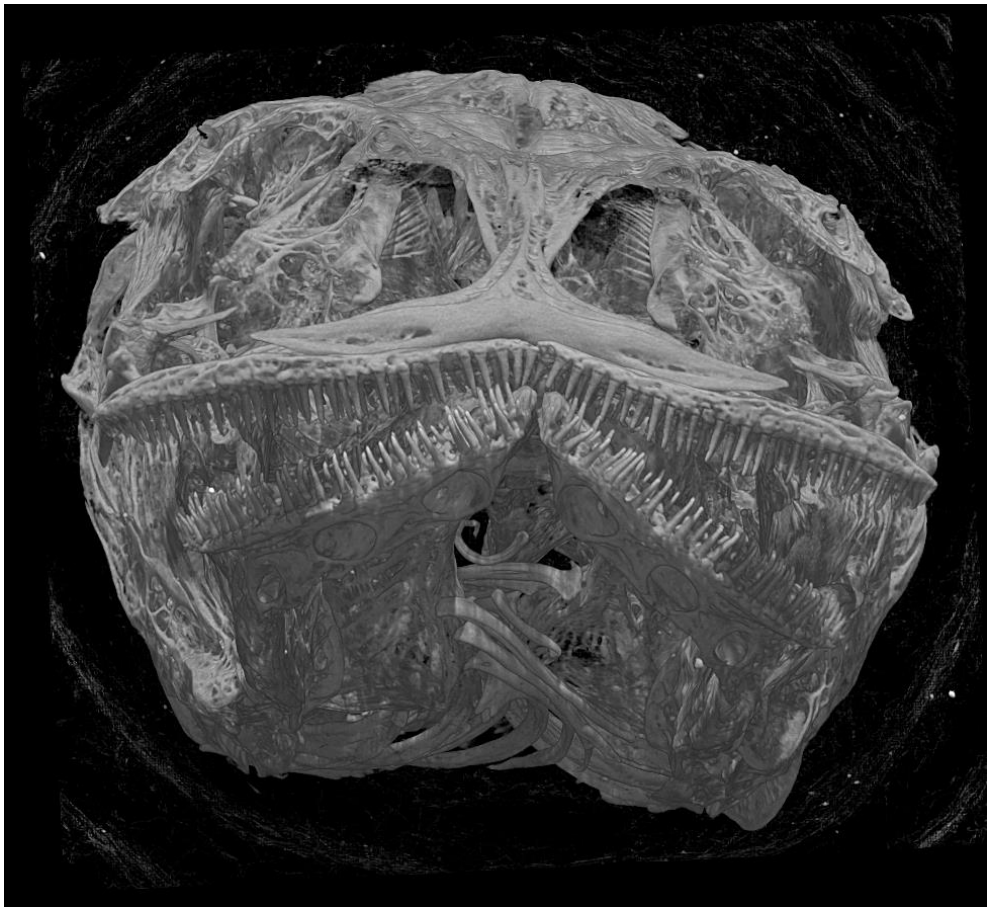


***P. lundbergi* holotype – described on the basis of only this one specimen**



This is what we found 10 miles N of the *P. lundbergi* type locality

Prietella lundbergi or ????

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